TABLE 1.—*Solar radiation intensities during June, 1928*

[Gram-calories per minute per square centimeter of normal surface]

Washington, D. C.

Date	Sun's zenith distance: 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon
	75th mer. time	Air mass: A. M.					P. M.				Local mean solar time
	e.	5.0	4.0	3.0	2.0	[1]1.0	2.0	3.0	4.0	5.0	e
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
June 8	11.38		0.68	0.84	0.89						10.97
9	13.61					1.29					14.10
14	20.24					1.32					16.20
15	12.68					1.25					12.24
16	6.76				1.06	1.28					5.79
25	17.37				1.12	1.28					16.79
27	11.38		0.69	0.87	1.08	1.30					10.59
28	13.61		0.65	0.82	1.00						11.38
30	15.65				0.90	1.06					12.68
Means			(0.67)	0.84	1.01	1.25					
Departures			+0.02	+0.09	+0.10	+0.03					

Madison, Wis.

June 2	5.79				1.26						6.27
7	6.27				1.06						9.83
14	9.47		0.87	1.01	1.17	1.48					6.76
15	7.29			0.94	1.13	1.36					7.29
26	7.29					1.35					9.14
Means			(0.87)	(0.98)	1.16	1.40					
Departures			−0.01	+0.01	−0.05	+0.08					

Lincoln, Nebr.

July 1	8.18					1.38	1.22	1.05	0.92		5.79
13	8.48		0.95	1.08							6.76
14	7.87		0.96	1.04	1.20	1.44					9.14
21	12.24		0.80	0.98	1.15	1.35					10.59
25	9.14			1.00	1.17						6.76
Means			0.90	1.02	1.17	1.39	(1.22)	(1.05)	(0.92)		
Departures			+0.12	+0.08	+0.06	+0.03	+0.12	+0.14	+0.12		

[1] Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface*

[Gram-calories per square centimeter of horizontal surface]

Week beginning—	Average daily radiation: Washington	Madison	Lincoln	Chicago	New York	Twin Falls	Average daily departure from normal: Washington	Madison	Lincoln
1928	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
June 4	449	394	393	250	336		−33	−119	−164
June 11	469	573	550	522	485	490	−23	+67	+36
June 18	345	364	440	290	218	684	−124	−155	−111
June 25[1]	552	438	498	280	393	670	+36	−101	−107
Excess or deficiency since first of year on July 1							−1,532	−480	−1,346

[1] 8-day mean.

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. C. S. Freeman, Superintendent U. S. Naval Observatory]

[Data furnished by Naval Observatory, in cooperation with Harvard, Yerkes, and Mount Wilson Observatories]

[The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic: Diff. long.	Longitude	Latitude	Area: Spot	Group	Total area for each day
1928	*h. m.*	°	°	°			
June 1 (Naval Observatory).	11 38	−33.0	182.7	−17.5		62	
		−27.5	188.2	+8.0		15	
		−21.0	194.7	+8.5	123		
		−16.0	199.7	−13.0		432	
		−7.5	208.2	+10.5		62	
		+0.5	216.2	+8.5		46	
		+13.0	228.7	−10.5		40	
		+36.0	251.7	+9.0	15		
		+66.5	282.2	+12.0	46		
		+69.0	284.7	−17.0	62		
		+78.0	293.7	−19.0	77		980
June 2 (Naval Observatory).	11 17	−68.0	134.7	+15.0		25	
		−39.5	163.2	−9.0		9	
		−36.0	166.7	+7.5	9		
		−34.0	168.7	+11.0		31	
		−20.5	182.2	−17.0		37	
		−8.5	194.2	+8.0	123		
		−3.5	199.2	−13.0		340	
		+6.0	208.7	+10.5		31	
		+13.0	215.7	+9.0		15	
		+28.0	230.7	−10.5		6	
		+49.5	252.2	+9.0		6	
		+80.0	282.7	+11.0	31		663
June 3 (Naval Observatory).	12 28	−19.0	169.8	+11.0		62	
		−7.5	181.3	−17.0	31		
		+6.0	194.8	+8.0		216	
		+10.0	198.8	−13.5		278	
		+20.0	208.8	+10.5		15	
		+28.5	217.3	+9.5		37	
		+29.0	217.8	−10.0		15	
		+62.0	250.8	+9.0	31		685
June 4 (Mount Wilson)	11 30	−29.5	146.6	+21.0		2	
		−6.0	170.1	+11.0		45	
		+6.0	182.1	−16.0		27	
		+19.0	195.1	+8.5		347	
		+23.0	199.1	−13.0		413	
		+32.0	208.1	−20.0		14	
		+37.0	213.1	+8.0		33	
		+42.0	218.1	−10.0		15	896
June 5 (Naval Observatory).	11 36	−15.0	147.8	+19.5		62	
		+2.5	165.3	+9.0		62	
		+7.0	169.8	+8.5		46	
		+11.0	173.8	+11.0	6		
		+18.5	181.3	−18.5		31	
		+31.5	194.3	+8.0		154	
		+35.0	197.8	−13.0		216	
		+52.0	214.8	+9.0		9	
		+54.0	216.8	−10.0		46	632
June 6 (Naval Observatory).	12 1	−79.0	70.3	−7.0	15		
		−2.5	146.8	+20.0		31	
		+1.5	150.8	+19.0	37		
		+15.5	164.8	+8.0		185	
		+20.5	169.8	+8.0		139	
		+31.0	180.3	−18.0	15		
		+47.0	196.3	+7.5		93	
		+48.0	197.3	−14.5		37	
		+49.5	198.8	−11.5	77		
		+68.0	217.3	−10.0		46	675
June 7 (Naval Observatory).	11 43	−72.0	64.3	−11.0	154		
		−65.0	71.3	−12.0	15		
		−42.5	93.8	−11.0		12	
		+11.0	147.3	+20.0		31	
		+16.0	152.3	+18.5	77		
		+28.0	164.3	+7.5	139		
		+32.0	168.3	+10.5		123	
		+35.0	171.3	+8.0	139		
		+44.5	180.8	−17.5	9		
		+59.0	195.3	+7.0		154	
		+60.5	196.8	−15.0		31	
		+63.5	199.8	−11.5	77		
		+77.5	213.8	−20.0	31		992

POSITIONS AND AREAS OF SUN SPOTS—Continued

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[The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1928	h. m.	°	°	°			
June 8 (Naval Observatory.)	11 50	−59.0	64.0	−11.0		93	
		−52.0	71.0	−12.0	15		
		+21.5	144.5	+20.5		31	
		+30.0	153.0	+18.5	77		
		+41.5	164.5	+8.0		170	
		+48.0	171.0	+8.0	185		
		+50.5	173.5	+10.5	62		
		+72.5	195.5	+6.5	108		
		+77.5	200.5	−11.0	93		834
June 9 (Naval Observatory).	11 9	−46.0	64.1	−10.5		77	
		+37.5	147.6	+20.0	15		
		+44.5	154.6	+18.5	62		
		+54.5	164.6	+7.5		185	
		+61.5	171.6	+8.0	247		
		+65.0	175.1	+10.5		77	663
June 10 (Naval Observatory.)	11 26	−31.0	65.7	−10.5		46	
		−22.5	74.2	−10.5		9	
		+60.0	156.7	+19.0	77		
		+68.5	165.2	+8.0	170		
		+73.5	170.2	+8.0	247		
		+75.0	171.7	+10.5		154	703
June 11 (Harvard)	11 11	+72.0	155.0	+18.5	54		54
June 12 (Harvard)	11 53	−5.5	65.0	−10.0		31	31
June 13 (Naval Observatory).	12 38	−50.0	6.3	+12.0		46	
		−46.5	9.8	+12.0		31	
		−45.0	11.3	−10.5		9	
		+7.0	63.3	−10.5		25	111
June 14 (Naval Observatory.	11 43	−37.5	6.1	+12.0		170	
		−36.0	7.6	+12.5		46	
		+19.5	63.1	−10.0	3		219
June 15 (Naval Observatory).	11 43	−59.5	330.9	+16.0	6		
		−23.0	7.4	+12.0		201	
		−20.5	9.9	−15.5		46	
		−17.5	12.9	+12.5	123		
		−12.0	18.4	−12.5		6	382
June 16 (Naval Observatory).	11 16	−85.0	292.4	+9.0	154		
		−9.5	7.9	+11.5		154	
		−9.5	7.9	−16.0		93	
		−6.5	10.9	−15.0	139		
		−4.5	12.9	+12.0	139		
		+0.5	17.9	−12.5		6	685
June 17 (Naval Observatory).	11 33	−71.5	292.5	+9.0	185		
		−67.0	297.0	+13.0		123	
		+2.5	6.5	−16.5		93	
		+3.5	7.5	+11.5		62	
		+7.5	11.5	−15.5	139		
		+8.5	12.5	+12.0	185		787
June 18 (Naval Observa-	11 37	−65.0	285.7	+13.5	6		
		−58.5	292.2	+9.0		170	
		−53.5	297.2	+13.0		62	
		+12.0	2.7	+7.0		6	
		+16.0	6.7	+18.0		37	
		+17.0	7.7	+11.0		46	
		+18.5	9.2	−17.0		170	
		+22.0	12.7	+11.5	185		682
June 19 (Naval Observatory).	13 42	−50.5	285.8	+13.0	9		
		−43.5	292.8	+9.0	139		
		−38.5	297.8	+13.0		62	
		+27.0	3.3	+8.0		62	
		+30.5	6.8	+19.0		62	
		+32.0	8.3	−15.5		154	
		+35.0	11.3	+12.5		370	858
June 20 (Naval Observatory).	14 1	−30.5	292.4	+9.0	139		
		−24.0	298.9	+13.5		15	
		+40.0	2.9	+8.0		62	
		+43.5	6.4	+19.0		46	
		+46.5	9.4	−16.0		154	
		+48.0	10.9	+12.5		463	879
June 21 (Mount Wilson)	9 45	−80.0	232.0	−12.0	119		
		−41.0	271.0	+16.0		20	
		−18.0	294.0	+10.0		213	
		−17.0	295.0	+15.0		23	
		+53.0	5.0	+8.0		17	
		+55.0	7.0	+18.0		13	
		+58.5	10.5	−16.5		58	
		+59.0	11.0	+12.0		764	
		+73.0	25.0	−9.0		24	1,251

POSITIONS AND AREAS OF SUN SPOTS—Continued

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Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1928	h. m.	°	°	°			
June 22 (Mount Wilson)	10 0	−86.0	212.6	−20.0	167		
		−76.0	222.6	+10.5		7	
		−66.0	232.6	−12.0	235		
		−54.0	244.6	+9.0		5	
		−27.5	271.1	+13.0		6	
		−14.0	284.6	+10.0		15	
		−6.5	292.1	+10.0		253	
		−3.0	295.6	+12.5		19	
		+67.0	5.6	+17.0	29		
		+70.5	9.1	−16.0		12	
		+73.0	11.6	+12.0	934		1,682
June 23 (Mount Wilson)	9 45	−82.0	203.5	+15.0		152	
		−73.0	212.5	−21.0		513	
		−63.0	222.5	+9.0		64	
		−53.0	232.5	−12.5	212		
		−40.0	245.5	+7.0		34	
		−15.0	270.5	+14.0		8	
		−4.0	281.5	+9.0		8	
		+7.5	293.0	+11.0		339	
		+16.0	301.5	+12.0		9	
		+80.0	5.5	+18.0	16		
		+85.0	10.5	+13.0	168		1,523
June 24 (Naval Observatory).	11 18	−72.0	199.5	+17.5		556	
		−63.0	208.5	+14.5		62	
		−62.5	209.0	−21.5		154	
		−55.0	216.5	−20.0	278		
		−51.0	220.5	+9.5		77	
		−47.0	224.5	+11.5	108		
		−38.0	233.5	−12.0		185	
		−25.0	246.5	+8.0		93	
		−14.0	257.5	+3.5		31	
		+1.5	273.0	+13.5		62	
		+21.5	293.0	+9.5		247	1,853
June 25 (Naval Observatory).	12 15	−58.0	199.7	+17.5		586	
		−50.5	207.2	−21.5		108	
		−49.0	208.7	+14.0		93	
		−41.5	216.2	−20.5		309	
		−39.0	218.7	+9.5	40		
		−33.0	224.7	+11.5	108		
		−25.0	232.7	−12.0		170	
		−10.5	247.2	+8.0		139	
		−2.0	255.7	+3.5		31	
		+14.5	272.2	+13.5		77	
		+35.0	292.7	+9.5		216	1,877
June 26 (Naval Observatory).	11 42	−72.5	172.3	+8.0	62		
		−46.0	198.8	+17.5		648	
		−38.5	206.3	−22.0		46	
		−37.0	207.8	+14.0		46	
		−28.0	216.8	−20.5		370	
		−25.5	219.3	+9.5		15	
		−20.0	224.8	+11.5	62		
		−12.0	232.8	−12.0		133	
		−6.5	238.3	−11.0		25	
		+.5	245.3	+8.0		31	
		+5.5	250.3	+8.0	62		
		+11.0	255.8	+3.5	9		
		+26.0	270.8	+12.0		31	
		+48.0	292.8	+9.5		216	1,756
June 27 (Naval Observatory).	11 46	−72.5	159.0	+19.0		123	
		−60.0	171.5	+9.0	46		
		−36.5	195.0	+18.0		247	
		−29.5	202.0	+18.0		247	
		−25.5	206.0	−21.5		31	
		−22.0	209.5	+16.5		37	
		−15.5	216.0	−19.5		494	
		−11.5	220.0	+10.5		6	
		−7.5	224.0	+12.0	83		
		+1.0	232.5	−11.5	108		
		+8.0	239.5	−9.5		31	
		+17.0	248.5	+8.5		154	
		+47.0	278.5	+6.0	12		
		+61.5	293.0	+11.0		340	1,959
June 28 (Naval Observatory).	11 47	−64.5	153.7	+4.5		15	
		−59.5	158.7	+19.0		108	
		−46.5	171.7	+8.0	46		
		−22.5	195.7	+18.0	278		
		−17.0	201.2	+18.0		216	
		−10.0	208.2	−23.5	9		
		−9.0	209.2	+15.5		31	
		−2.5	215.7	−19.5		463	
		+3.0	221.2	+10.5		15	
		+7.5	225.7	+11.5	62		
		+14.5	232.7	−11.5	123		
		+21.5	239.7	−10.0		22	
		+30.0	248.2	+8.5		154	
		+73.5	291.7	+11.0		309	1,851

POSITIONS AND AREAS OF SUN SPOTS—Continued

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Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1928	h. m.	°	°	°			
June 29 (Naval Observatory).	11 51	−50.5	154.5	+5.0		25	
		−46.5	158.5	+19.0		46	
		−45.0	160.0	+5.0	6		
		−32.5	172.5	+8.0	43		
		−14.0	191.0	+10.0	3		
		−9.5	195.5	+18.0	216		
		−4.0	201.0	+18.0		108	
		+3.0	208.0	+17.0		46	
		+10.5	215.5	−19.5		463	
		+20.0	225.0	+11.5	52		
		+28.5	233.5	−12.0	108		
		+34.0	239.0	−10.0		3	
		+44.5	249.5	+9.0		93	1,212
June 30 (Harvard)	8 50	−36.5	157.0	+6.5		56	
		−35.0	158.5	+20.0		39	
		−22.0	171.5	+9.0	65		
		+6.0	199.5	+18.0		573	
		+23.5	217.0	−20.0		880	
		+30.5	224.0	+12.5		54	
		+39.0	232.5	−12.5	203		
		+56.5	250.0	+9.0	113		1,983
Mean daily area for June							979

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR MAY, 1928

[Data furnished by Prof. A. Wolfer, University of Zurich, Switzerland]

May	Relative numbers	May	Relative numbers	May	Relative numbers
1	124	11	85	21	14
2	126	12	62	22	22
3	126	13	34	23	41
4	109	14	26	24	34
5	114	15	15	25	49
6	117	16	16	26	40
7	142	17	15	27	54
8	133	18	13	28	112
9	146	19	15	29	139
10	119	20	0?	30	150
				31	153

Number of observations, 31; mean, 75.6.

PROVISIONAL SUNSPOT RELATIVE NUMBERS FOR JUNE, 1928

[Data furnished by Prof. A. Wolfer, University of Zurich, Switzerland]

June	Relative numbers	June	Relative numbers	June	Relative numbers
1	134	11	24	21	89
2	133	12	7	22	109
3	110	13	29	23	131
4	100	14	25	24	145
5	98	15	43	25	154
6	90	16	53	26	134
7	95	17	64	27	145
8	74	18	62	28	126
9	43	19	94	29	134
10	32	20	63	30	114

Number of observations, 30; mean, 88.5.

AEROLOGICAL OBSERVATIONS

By W. R. STEVENS

Free-air temperatures for June were mostly below normal except at Washington. Aside from a gradual increase at Ellendale, departures from normal decreased with altitude. It was the coolest June of record at Broken Arrow and Royal Center, and with but one exception at Due West and Ellendale. The lowest June temperature was recorded during the month at the two latter stations.

Relative humidities averaged slightly above normal.

Vapor pressures were somewhat above normal at Broken Arrow, Due West and Washington, and below at Ellendale, Groesbeck and Royal Center.

Resultant winds were almost entirely of southerly component at and near the surface. The area of winds of northerly component gradually increased with altitude from north to south, and at an altitude of 6,000 meters included practically the entire country.

Every station obtained an unusually large number of kite flights shortly before the occurrence of thunderstorms and a few when the storms were in progress. In one instance it is believed that the wire was actually struck by lightning. The official in charge at Ellendale says in this connection:

> At about 2,600 meters out, while reeling in the flight of the 27th, the head kite broke away with about 200 meters of wire. The cause of the break is not definitely known but from the appearance of the kite bridle, which was slightly burned, it would seem that a mild lightning discharge struck it. This flight is of more or less interest in that it was made in a somewhat threatening condition. Light rain fell during the flight, beginning at 8.22 a. m. and continuing through the flight. The conditions were ripe for thunderstorm development. Static discharges were high, some measurements being greatly in excess of 10,000 volts.—*L. A. Warren.*

Special observations were made on the 28th, 29th and 30th at a number of selected balloon stations and forwarded to Detroit for the information of contestants in the international Gordon Bennett balloon race.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during June, 1928*

TEMPERATURE (° C.)

Altitude m. s. l. (meters)	Broken Arrow, Okla. (233 meters)		Due West, S. C. (217 meters)		Ellendale, N. Dak. (444 meters)		Groesbeck, Tex. (141 meters)		Royal Center, Ind. (225 meters)		Washington, D. C.[1] (7 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	23.4	−1.5	24.6	−1.4	16.2	−2.5	23.9	−2.0	17.5	−4.3	26.2	+2.8
250	23.2	−1.6	24.2	−1.4			23.0	−1.9	17.2	−4.3	23.5	+2.1
500	21.1	−1.8	21.7	−1.3	15.8	−2.5	21.0	−1.9	15.7	−3.2	21.0	+1.2
750	19.6	−1.8	20.2	−1.1	14.0	−2.7	19.9	−1.5	14.3	−2.8	19.0	+0.9
1,000	18.3	−1.8	18.6	−1.1	12.5	−2.8	19.7	−0.6	12.9	−2.7	17.3	+0.6
1,250	17.0	−1.8	17.2	−0.9	10.6	−3.4	19.3	+0.1	11.8	−2.3	15.5	+0.4
1,500	15.9	−1.6	15.7	−0.7	9.2	−3.5	18.9	+0.8	10.7	−2.1	13.7	+0.1
2,000	14.1	−0.7	12.6	−0.5	6.2	−3.6	16.8	+1.0	8.5	−1.7	10.4	−0.2
2,500	12.2	+0.2	9.6	−0.4	2.9	−4.0	14.0	+0.8	6.5	−1.0	7.5	−0.4
3,000	9.6	+0.6	6.4	−0.5	−0.1	−4.2	10.8	+0.3	4.3	−0.5	4.6	−0.4
3,500	7.4	+1.5	3.6	−0.1	−3.3	−4.5			2.1	−0.1		
4,000	5.6	+2.8	0.4	−0.4	−6.1	−4.5			0.1	+0.3		
4,500			−2.4	−0.8	−9.3	−4.6			−1.7	+1.2		
5,000												

[1] Naval air station.